

# Whiplash: The possible impact of context on diagnosis

Clough, A.E.,<sup>1</sup> Flynn, J.M.,<sup>2</sup> Horne, J.K.,<sup>3</sup> Earle, F.,<sup>3</sup> Clough, P.J.<sup>4</sup>

## Affiliation:

<sup>1</sup> Hull & East Yorkshire NHS Trust

<sup>2</sup> School of Human and Health Sciences, University of Huddersfield  
<sup>3</sup> Department of Psychology, University of Hull

<sup>4</sup> Department of Psychology, Manchester Metropolitan University

## Abstract

This study explores the importance of context when diagnosing Whiplash Associated Disorders (WAD). Whiplash is a complex injury and there is considerable variation in its diagnosis and treatment. Research has focussed on RTAs, whilst there is a paucity of evidence relating to WAD in sport. It is unclear whether WAD is simply not occurring in sport, or if such injuries are occurring but are not identified as WAD. In the current study, 87 postgraduate physiotherapists were asked to classify an injury reported in a short vignette. Two parallel vignettes were used, which were identical except for the context of the injury (one being an RTA and the other being within sport). Each participant responded to only one of these. It was found that, even within a sample of experienced physiotherapists, the injury environment impacted on diagnosis, despite the symptoms being identical. A significantly higher proportion of therapists diagnosed WAD within the RTA context than within the sporting context. Additionally, there were differences between the two context groups in relation to the diagnostic terminology used by participants. Most respondents had heard of the CSP whiplash guidelines but only a minority had actively used these. The majority of respondents were also aware of the litigation aspects of RTAs.

**Key words:** Whiplash, Road Traffic Accident (RTA), Sport

## Introduction

Whiplash Associated Disorder (WAD) is multi-factorial, which has led to the development of many potential assessment and management strategies, for which practitioners want and seek guidance. There is a wealth of literature which investigates whiplash in a motor vehicle scenario (e.g. Pastakia & Kumar, 2011; Kamper, Rebbeck, Maher, McAuley & Sterling, 2008). However, there is a paucity of literature linking WAD to contact-related sports injuries such as those sustained in rugby. Injuries which occur in sport to the neck and upper back are not generally diagnosed as whiplash, although there is no clear reason for this, and therefore are not graded as whiplash associated injuries or disorders using the QTF grading system.

Chard and Lachmann (1987) reported on the prevalence of under-reporting of injuries in a sporting context. They found that athletes will naturally try to hide an injury if possible. McIntosh et al. (2010) found that contact events, such as tackles, are the main mechanism for neck injuries within rugby league, accounting for 51% of all injuries, affecting both the tackler and the person being tackled. Gibbs (1993) reported that injury rate due to tackling decreased with greater player skill and technique. Clough and colleagues (2011) found that WAD is rarely reported in rugby, although the reason for this is far from clear. Factors that may contribute to this under-reporting of WAD may include having other reasons for not having an injury investigated by a medical practitioner or physiotherapist (e.g. fears over

selection, contractual issues), the club not having direct access to a specified doctor, a lack of awareness to seek appropriate guidance from a medical practitioner when an injury occurs, or not having the finances available to visit a medical practitioner.

Linton (2000) reported that early access to treatment is an important factor in reducing the development of associated symptoms. It is, therefore, vital that an accurate initial diagnosis is achieved because, not only does it allow the medical practitioner to design a suitable rehabilitation programme, it will also reduce the risks of any secondary injuries which may occur. Lephart et al. (1997) confirm that an accurate diagnosis will result in a specific rehabilitation program, which is the most effective way to ensure that a player returns to their pre-injury state. An effective rehabilitation program can improve both a players' physical and psychological health when an injury occurs.

The fact that WAD diagnosis is rare within sport might create a self-fulfilling prophecy with regards to diagnosis: WAD does not occur in sport, the injury is a sporting one and therefore it cannot be WAD. It is suggested that the context in which a WAD of the cervical spine is presented may have a significant impact upon the physiotherapist assessing the patient in terms of diagnosis and classification of WAD. Conversely, injuries in the context of RTAs may lead to over-reporting and over-diagnosis of WAD.

One of the key issues that may impact on the accuracy of diagnosis and treatment success is the prevalence of compensation claims linked to road traffic accidents. Compensation claims have been found to impact on recovery for patients suffering WAD (Cote, Cassidy & Carroll, 2003). Cassidy et al. (2000) concluded that if compensation claims for pain were eliminated then this would be associated with improved recovery rates and a decreased incidence of WAD. However, Spearing and Connelly (2011) found that, although compensation and health were linked, this area is complex and in need of more research. Clearly, WADs from RTAs are very litigious and could have a significant impact on the therapist.

One attempt to try to reduce variability in whiplash diagnosis and treatment was the introduction of WAD guidelines. In 2003, the Chartered Society of Physiotherapy (CSP) commissioned the design and implementation of structured guidelines for the management of WAD to reduce the prevention of chronic symptoms. In the present study the usage and impact of these will be assessed.

This study aims to address the following two broad research questions:

- (i) Does the apparent context of an injury impact on the diagnosis of WAD?
- (ii) Are the CSP WAD guidelines utilised and could they be improved to facilitate their usage?

## **Methodology**

Full ethical approval was obtained from the Ethics Committee of the Department of Psychology at the University of Hull prior to carrying out the study.

### *Design*

A randomised control design was adopted. The independent variable was the scenario (RTA v Sport) and the dependent variable was the classification given, assessed by the use of enhanced classification (Sterling, 2004). The validity of the enhanced classification was demonstrated by Jull, Sterling, Falla, Treleaven and O'Leary (2008).

### Participants

The participants in the sample were 87 postgraduate physiotherapists. Sixty-two of the participants were female (mean age 33.3, SD 9.7) and 25 were male (mean age 34.6, SD 8.8). The sample size was governed by the time allocated to this study, rather than a power analysis, because of the preliminary/pilot nature of this study. All participants were students on the Masters modules run by the Society of Musculoskeletal Medicine (SOMM), a professional network of the Chartered Society of Physiotherapy, which promotes a practical and evidenced-based approach to orthopaedic medicine based upon the work of Cyriax. The majority (62%) of the physiotherapists worked in the NHS, with the others having a range of jobs in either the private sector or Ministry of Defence.

Initially, participants were recruited via an advert in a SOMM professional journal and were asked to access the randomly allocated case study online. However, only 17 participants (20%) were recruited using this method. Therefore, the online questionnaire was produced in a printed format and distributed at postgraduate SOMM courses across the UK for completion.

### Materials

At the core of the questionnaire was one of two vignettes, both involving a patient with a neck injury (see Appendix). The vignettes were identical apart from the causation of the injury: in one the cause was an RTA, in the other the cause was a sporting one. The scenarios were written to encompass the definition of WAD proposed by Sterling (2004). Sterling adapted the Quebec Task Force classification based on identified physical and psychological factors. These are summarised in Table 1. A simple randomisation procedure was utilised, with participants alternately receiving the RTA and sporting scenarios.

Table 1. Sterling's (2004) adapted Quebec Task Force classification

WAD 0	No complaint about neck pain No physical symptoms
WAD I	Neck complaint of pain, stiffness or tenderness only No physical signs
WAD IIA	Neck pain Motor impairment Decreased range of movement Altered muscle recruitment patterns Sensory impairment Local cervical mechanical hyperalgesia
WAD IIB	Neck pain Motor impairment Decreased range of movement Altered muscle recruitment patterns Sensory impairment Local cervical mechanical hyperalgesia Psychological impairment Elevated psychological distress

WAD IIC	<ul style="list-style-type: none"> <li>Neck pain</li> <li>Motor impairment</li> <li>Decreased range of movement</li> <li>Altered muscle recruitment patterns</li> <li>Increased joint position error</li> <li>Sensory impairment</li> <li>Local cervical mechanical hyperalgesia</li> <li>Generalised sensory hypersensitivity</li> <li>Some may show sensory nervous system disturbances</li> <li>Psychological impairment</li> <li>Psychological distress</li> <li>Symptoms of acute post-traumatic stress</li> </ul>
WAD III	<ul style="list-style-type: none"> <li>Neck pain</li> <li>Motor impairment</li> <li>Decreased range of movements</li> <li>Altered muscle recruitment patterns</li> <li>Increased joint position error</li> <li>Sensory impairment</li> <li>Local cervical mechanical hyperalgesia</li> <li>Generalised sensory hypersensitivity</li> <li>Some may show sensory nervous system disturbances</li> <li>Psychological impairment</li> <li>Psychological distress</li> <li>Symptoms of acute posttraumatic stress</li> <li>Neurological signs of conduction loss, including:</li> <li>Decreased or absent deep tendon reflexes</li> <li>Muscle weakness</li> <li>Sensory deficits</li> </ul>
WAD IV	Fracture or dislocation

The vignettes were written in order to reflect the WAD II classification. It was felt that this cluster provides the most appropriate symptomology as it reflects the day-to-day experience of therapists. The respondents were asked to provide their diagnosis in an open-ended question. Forty-three participants received the sporting scenario, whilst 44 received the RTA scenario. In addition, the questionnaire had a small number of items examining the impact of the CSP guidelines and a question on compensation. These categorical data were analysed using a series of chi-square tests.

## Results

There were no group differences between respondents who were administered the RTA vignette and those who were given the sport vignette in terms of gender proportions, age, employment sector or experience.

For the RTA scenario, 87% (n=39) of participants produced a WAD diagnosis; whereas for the sporting scenario, 67% (n=29) reported it as WAD. A chi-square analysis showed a significant difference between the groups in the diagnosis given ( $\chi^2[1, N=87] = 5.73, p < 0.05$ ; effect size  $r = 0.26$ ).

There was diversity amongst the sample in the reporting of the 'source of the symptoms/target tissues'. Target tissues highlighted were disc, facet joints, cervical level 4 motion segment and trapezius.

There were found to be clear differences between the physiotherapists in the two scenario groups in the expectation that the case would be involved in litigation (see Table 2). A chi-square analysis using two collapsed categories (Always/ Frequently versus Seldom) found physiotherapists in the RTA scenario group to be significantly more likely to expect

litigation than those in the sport scenario group ( $\chi^2[1, N=87]=26.7$ ,  $p<0.001$ ; effect size  $r=0.55$ ).

Table 2. Perceived likelihood of case being involved in litigation

	Always	Frequently	Seldom	Don't know
RTA	61%	28%	7%	4%
Sport	14%	21%	53%	12%

In relation to the CSP WAD guidelines, 92% of the sample reported that they were aware of these, although only 46% had actually seen them. Of the participants who had seen the guidelines, only 23% often referred to these, 33% used them rarely and the remaining 44% reported never using them. An additional analysis was carried out to ascertain if usage of the guidelines reduced the impact of context within the sport context group (see Table 3). A chi-square analysis found no significant difference in diagnosis between participants in the sport scenario group who used guidelines and those who did not ( $\chi^2[1, N=43]=2.43$ ,  $p>0.05$ ; effect size  $r=0.24$ ).

Table 3. Effect of guideline use on diagnosis within the sport context group

	WAD diagnosis	Non-WAD diagnosis
Uses guidelines	16 (76%)	5 (24%)
Doesn't use guidelines	13 (59%)	9 (41%)

## Discussion

The context of the mechanism of neck trauma had a clear impact upon the mental model used by physiotherapists when making a diagnosis of WAD. Physiotherapists were more confident in making the diagnosis of WAD if the context of the trauma was an RTA, in comparison to a sporting context. Whilst there are a small number of articles on severe neck injuries sustained in a sporting context, these are not related to, or contextualised within, a WAD diagnostic structure (Stephenson et al., 1996; Gibbs, 1993). In this study, the terminology used by physiotherapists to make a diagnosis was distinctly different between the two scenarios. For the RTA scenario, 87% produced diagnoses that were classified as WAD, with most of those specifying a II(b) WAD utilising Sterling's (2004) classification. In comparison, only 67% of participants in the sporting scenario reported the injury as WAD, using alternative terminology for their diagnosis, such as neck pain, acute neck trauma and neck injury. Whilst these are clearly elements of WAD, whiplash was not specifically referred to.

The majority of physiotherapists were aware of the CSP national guidelines on the management of WAD but most didn't use them on a regular basis. This is clearly an important issue as the guidelines were introduced to reduce some of the uncertainties

within WAD diagnosis. If the guidelines are not referred to, they cannot do this effectively. It is unclear how this relates to other guideline usage as there is general paucity of research into this area. Using the sports vignette sample only, as this sample had considerable variability in its classification of injury as WAD, a comparison was carried out between the therapists who had used the guidelines and those who had not. Although the difference did not reach statistical significance, the figures do show that most of the participants who use the guidelines (76%) did diagnose WAD, whereas only 51% of those who did not use the guidelines made this diagnosis. Use of the guidelines might, therefore, reduce the contextual impact of the injury, or it may be that 'WAD-focused' therapists are more likely to access the guidelines. The impact, or lack of impact, of the guidelines is clearly a key factor in whiplash diagnosis and treatment in the UK. More research is needed to fully explore ways of increasing the guideline usage. Possible improvements include modifying the guidelines, incorporating them at the core of CPD activities and increasing their profile and their accessibility.

Nearly all the therapists presented with the RTA vignette were very aware of the litigation that is integral to this area. Assuming that litigation is ongoing, without evidence, may well impact on the therapists' views of the injury presented to them as described in previous studies (e.g. Karnezis, Drosos & Kazakos, 2007). Similarly, an assumption that litigation will not be present within a sporting context may also skew diagnosis and treatment options.

This study had some limitations. Firstly, the use of vignettes, rather than 'real' cases, may limit the validity of the findings. However, the fact that the questionnaires were administered in a very person-centred environment (i.e. on a training course) may have mitigated against this. In addition, the use of vignettes in health related research is well validated (e.g. Rice, Robone & Smith, 2011). Secondly, the sample used is clearly not representative of therapists in general. They were more experienced and were undertaking postgraduate training that was directly relevant to WAD diagnosis and treatment. However, the fact that the participants were more experienced than the average physiotherapist means that the observed contextualisation effects could be much greater in a less experienced sample. Finally, it would have been helpful to have a bigger sample. Unfortunately, the use of an invitation to complete a web-based questionnaire was very ineffective. It was therefore necessary to personally distribute the questionnaire, leading to a limited available sample.

## **Conclusions**

It was found that, within a sample of experienced physiotherapists, the injury environment impacted on diagnosis, despite symptoms being identical. A higher proportion of participants diagnosed WAD within the RTA context than within the sporting context. There needs to be a wider understanding of the potential impact of the context of injury on diagnosis and treatment by front line therapists. This could be achieved by encouraging the better use of the WAD guidelines, perhaps by the introduction of summary guidelines that are easier for therapists to access.

## References

- Cassidy, J., Carroll, L., Côté, P., Lemstra, M., Berglund, A. & Nygren, A. (2000). Effect of eliminating compensation for pain and suffering on the outcome of insurance claims for whiplash injury. *The New England Journal of Medicine*, 342(16), 1179-1186.
- Chard, M.D. & Lachmann, S.M. (1987). Racquet sports - patterns of injury presenting to a sports injury clinic. *British Journal of Sports Medicine*, 21, 150-153.
- Clough, A., Clough, P.J., Kelly, I. & Earle, F. (2011). Rugby players and whiplash: Where are all the cases? *British Journal of Sports Medicine*, 45, 339-340.
- Cote, P.P., Cassidy, J.D. & Carroll, L.L. (2003). The epidemiology of neck pain: what we have learned from our population-based studies. *Journal of the Canadian Chiropractic Association*, 47(4), 284-290.
- Gibbs, N. (1993). Injuries in professional rugby league: A three-year prospective study of the South Sydney Professional Rugby League Football Club. *American Journal of Sports Medicine*, 21(5), 696-700.
- Jull, G., Sterling, M., Falla, D., Treleaven, J. & O'Leary, S. (2008). *Whiplash, Headache and Neck Pain: Research-Based Directions for Physical Therapies*. London: Churchill Livingstone Elsevier.
- Kamper, S.J., Rebeck, T.J., Maher, C.G., McAuley, J.H. & Sterling, M. (2008). Course and prognostic factors of whiplash: a systematic review and meta-analysis. *Pain*, 138(3), 617-629.
- Karnezis, I.A., Drosos, G.I. & Kazakos, K.I. (2007). Factors affecting the timing of recovery from whiplash neck injuries: study of a cohort of 134 patients pursuing litigation. *Archives of Orthopaedic and Trauma Surgery*, 127(8), 633-636.
- Lephart, S.M., Pincivero, D.M., Giraldo, J.L. & Fu, F.H. (1997). The role of proprioception in the management and rehabilitation of athletic injuries. *American Journal of Sports Medicine*, 25(1), 130-7.
- Linton, S.J. (2000). A review of psychological risk factors in back and neck pain. *Spine*, 25, 1148-1156.
- McIntosh, A.S., McCrory, P., Finch, C.F. & Wolfe, R. (2010). Head, face and neck injury in youth rugby: incidence and risk factors. *British Journal of Sports Medicine*, 44(3), 188-193.
- Pastakia, K. & Kumar, S. (2011). Exercise parameters in the management of breast cancer: a systematic review of randomized controlled trials. *Physiotherapy Research International*, 16(4) 237-242.
- Rice, N., Robone, S. & Smith, P. (2011). Analysis of the validity of the vignette approach to correct for heterogeneity in reporting health system responsiveness. *The European Journal of Health Economics*, 12(2), 141-162.
- Spearing, N.M. & Connelly, L.B. (2011). Is compensation "bad for health"? A systematic meta-review. *Injury*, 42(1), 15-24.
- Stephenson, S., Gissane, C. & Jennings, D. (1996). Injury in rugby league: a four year prospective survey. *British Journal of Sports Medicine*, 30, 331-334.

Sterling, M. (2004). A proposed new classification system for whiplash associated disorders: Implications for assessment and management. *Manual Therapy, 9*, 60-70.

## **Appendix 1: The Vignettes**

### The Sporting vignette

A 27 year old university student has injured his cervical spine. He plays for the university rugby team. During a match he was tackled from behind. Another player ran into him at speed.

The onsite medic 'ran on'. The student is complaining of a headache, neck pain and some right shoulder pain. The onsite medic has advised the student to attend the onsite university sport injury clinic after attending the accident and emergency department.

He attends the clinic 2 days later for assessment, advice and rehabilitation. The x-ray has been reported as normal.

On examination he reports a headache which is 4/10 at rest and feels as though it is across the forehead. He also has local pain on the lateral aspect of the right side of his neck, 3/10 on the Visual Analogue Scale (VAS) at rest. When he actively moves his neck into right rotation to reach for his seatbelt he reports the pain spreading to his right shoulder.

He is able to move his neck but the range is very limited by pain and he reports it feels 'stiff' and 'tight'. He admits he is very apprehensive about moving his neck. He has poor posture. It is observed he has a 'poking chin'. His shoulders are both elevated in a protective stance.

On examination all movements are approximately a ¼ of normal range. The most painful active movements are forward flexion and right rotation. Both active movements increase the pain at rest from 3/10 to 8/10. He is married and has a young baby. He works part time as a computer programmer and has a dissertation to complete. It is due for submission in 6 weeks.

### The RTA vignette

A 27 year old university student has injured his cervical spine. He plays for the university rugby team. Travelling to University he was involved in a road traffic accident (RTA). He was driving. A car ran into the rear of his car at approximately 30 miles per hour.

An off duty doctor witnessed the collision and went to the student's aid. The student is complaining of a headache, neck pain and some right shoulder pain. The attending doctor has advised the student to attend the onsite university musculoskeletal clinic after attending the accident and emergency department.

He attends the clinic 2 days later for assessment, advice and rehabilitation. The x-ray has been reported as normal.

On examination he reports a headache which is 4/10 at rest and feels as though it is across the forehead. He also has local pain on the lateral aspect of the right side of his neck, 3/10 on the Visual Analogue Scale (VAS) at rest. When he actively moves his neck into right rotation to reach for his seatbelt he reports the pain spreading to his right shoulder.

He is able to move his neck but the range is very limited by pain and he reports it feels 'stiff' and 'tight'. He admits he is very apprehensive about moving his neck. He has poor posture. It is observed he has a 'poking chin'. His shoulders are both elevated in a protective stance.

On examination all movements are approximately a ¼ of normal range. The most painful active movements are forward flexion and right rotation. Both active movements increase the pain at rest from 3/10 to 8/10. He is married and has a young baby. He works part time as a computer programmer and has a dissertation to complete. It is due for submission in 6 weeks.